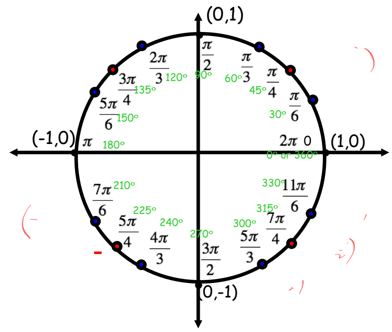
Precalc Warm Up # 9-2

Solve on $[0, 2\pi)$. Also, give the General Solution.
Give exact answers when possible.

1. $\csc 3x = -2$

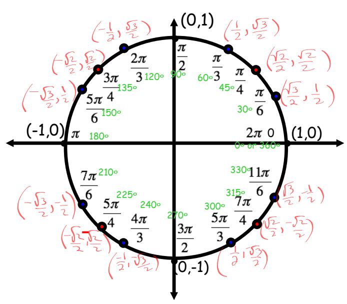
2. $\cos x + \sin x \tan x = 2$

3. $\tan \frac{1}{3}x = \sqrt{3}$



---

2. $\cos x + \sin x \tan x = 2$



$$\cos x + \frac{\sin x \sin x}{\cos x} = 2$$

$$\frac{\cos x}{\cos x} \cdot \frac{\cos x}{1} + \frac{\sin^2 x}{\cos x} = 2$$

$$\frac{\cos^2 x + \sin^2 x}{\cos x} = 2$$

$$\frac{1}{\cos x} = 2$$

$$\cos x = \frac{1}{2}$$

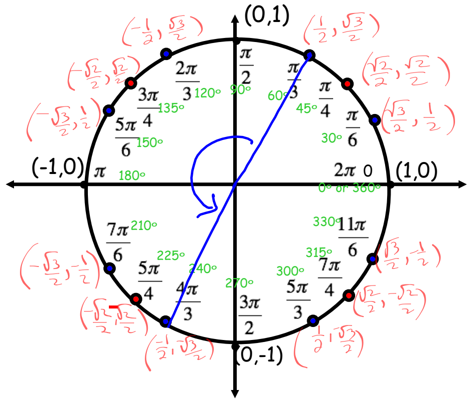
$$x = \cos^{-1}\left(\frac{1}{2}\right)$$

$$\boxed{x = \frac{\pi}{3}, \frac{5\pi}{3}}$$

general

$$\boxed{\begin{aligned} x &= \frac{\pi}{3} + 2\pi n \\ &= \frac{5\pi}{3} + 2\pi n \end{aligned}}$$

3. $\tan \frac{1}{3}x = \sqrt{3}$



$\frac{1}{3}x = \tan^{-1}(\sqrt{3})$

$3 \cdot \frac{1}{3}x = \left(\frac{\pi}{3} + \pi n\right)3$

$\boxed{x = \pi + 3\pi n}$

on $[0, 2\pi)$

$x = \pi$

HW Questions, p. 422

Find all solutions (This means find the General Solution.)

7. $2\cos x + 1 = 0$

11. $2\sin^2 x = 1$

15. $\tan x(\tan x - 1) = 0$

$\tan x = 0$

$x = \tan^{-1} 0$

$x = 0, \pi$

$\tan x - 1 = 0$

$\tan x = 1$

$x = \tan^{-1}(1)$

$x = \frac{\pi}{4}, \frac{5\pi}{4}$

general

$x = \pi n$

$x = \frac{\pi}{4} + \pi n$

19. $\cos x(2\cos x + 1) = 0$

In Exercises 21–40, find all solutions in the interval $[0, 2\pi)$. (Do not use a calculator.)

23. $2\sin^2 x + 3\sin x + 1 = 0$

27. $2\sin^2 x = 2 + \cos x$

31. $2\sin x + \csc x = 0$

$2\sin x = -\csc x$

$\frac{2\sin^2 x}{\sin x} + \frac{1}{\sin x}$

$\frac{2\sin^2 x + 1}{\sin x} = 0$

$2\sin^2 x + 1 = 0$

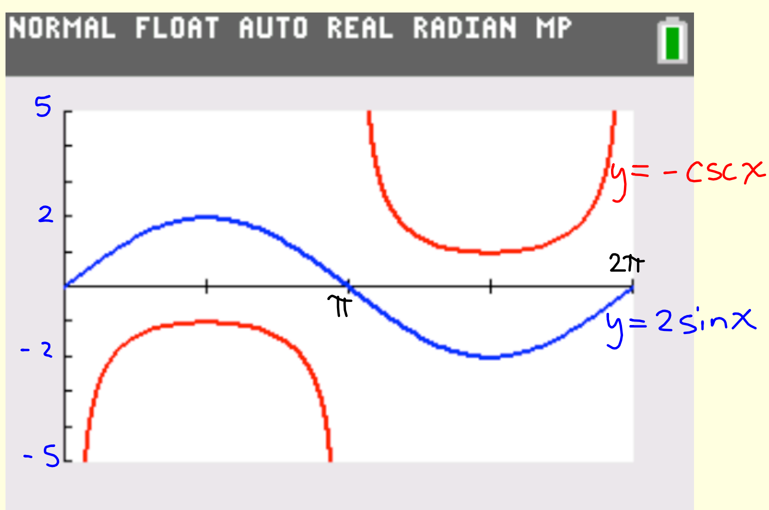
$\sin^2 x \neq -\frac{1}{2}$

$(\ )^2 \neq -$

35. $\cos\frac{x}{2} = \frac{\sqrt{2}}{2}$

Checking the graphs to confirm answer for # 31:

$2\sin x = -\csc x$



39. $\dfrac{1+\sin x}{\cos x} + \dfrac{\cos x}{1+\sin x} = 4$

combine the fractions (need same denominator)
then factor the top & simplify...

In Exercises 41–50, use a calculator to find all solutions in the interval $[0, 2\pi)$.

41. $2\tan^2 x + 7\tan x - 15 = 0$

$(2\tan x \quad)(\tan x \quad) = 0$

$(2 - 3)(1 + 5) = 0$

$(4 - 3)(3 - 1) = 0$

$(2 - 3)(3 - 2) = 0$

1.6, 2·3

~~1·12~~, 2·6, 3·4

43. $12\sin^2 x - 13\sin x + 3 = 0$

45. $6\cos^2 x - 13\cos x + 6 = 0$

47. $\tan^2 x - 8\tan x + 13 = 0$

49. $\sin^2 x + 2\sin x - 1 = 0$

$\sin x = \dfrac{-2 \pm \sqrt{4 - 4(1)(-1)}}{2}$

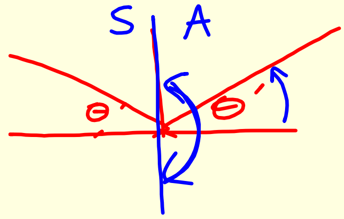
just +

$x = \sin^{-1}(-1 \pm \sqrt{2})$

$x \approx 0.427 \leftarrow \theta'$

$x \approx \pi - 0.427$

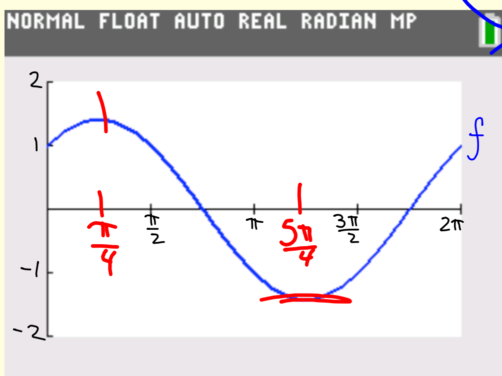
$x \approx$



51. The function $f(x) = \sin x + \cos x$ has maximum or minimum values when

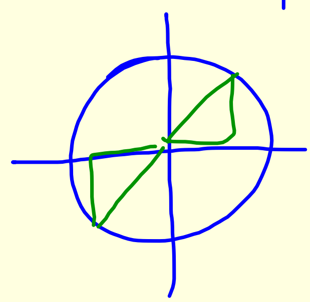
$\cos x - \sin x = 0.$

Find all solutions of this equation in the interval $[0, 2\pi)$ and sketch a graph of the function f.



$\cos x = \sin x$

$x = \frac{\pi}{4}, \frac{5\pi}{4}$



Was log (x + y) = log x + log y ?

Is sin (u + v) = sin u + sin v ?

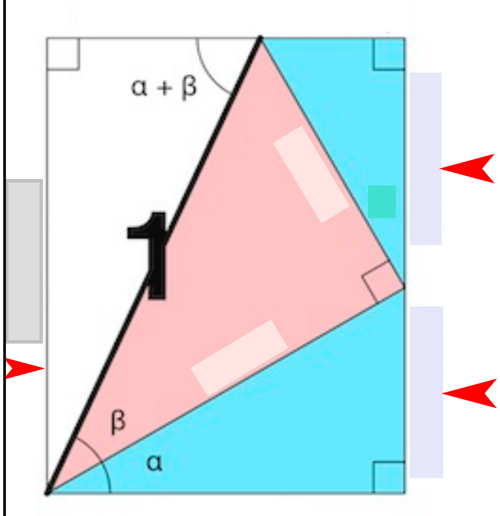
Sum and difference formulas:

$$\sin(u \pm v) = \sin u \cos v \pm \cos u \sin v$$

$$\cos(u \pm v) = \cos u \cos v \mp \sin u \sin v$$

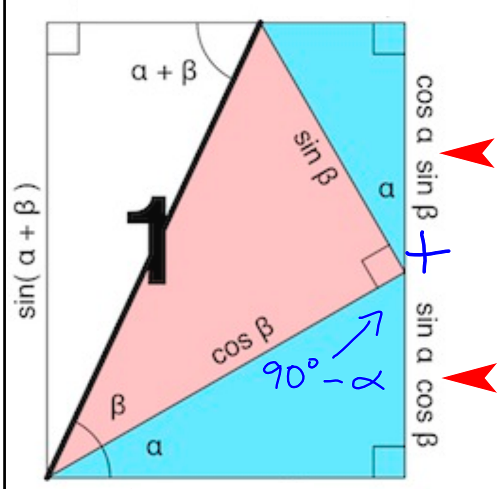
$$\tan(u \pm v) = \frac{\tan u \pm \tan v}{1 \mp \tan u \tan v}$$

Proof of sin (α + β) = sin α cos β + cos α sin β



1. Start with the pink triangle. Let the hypotenuse equal 1
2. Find the legs.
3. Create the blue triangles.
4. Find the angles in terms of α, then find the indicated legs.
5. Find sin (α + β)

Proof of sin (α + β) = sin α cos β + cos α sin β



1. Start with the pink triangle. Let the hypotenuse equal 1
2. Find the legs.
3. Create the blue triangles.
4. Find the angles in terms of α, then find the indicated legs.
5. Find sin (α + β)

$\sin\alpha = \frac{y}{\cos\beta}$

y

The sum and difference formulas can be used for:

- Finding exact trig values for non-special angles
- Proving identities
- Deriving or verifying other identities
- Solving equations

$30°, 45°, 60°$

example: find the exact value of

cos 105°

$\cos(45° + 60°)$

$= \cos 45° \cos 60° - \sin 45° \sin 60°$

$= \frac{\sqrt{2}}{2} \cdot \frac{1}{2} - \frac{\sqrt{2}}{2} \cdot \frac{\sqrt{3}}{2}$

$\boxed{\frac{\sqrt{2} - \sqrt{6}}{4}} \xrightarrow{\text{book}} \frac{\sqrt{2}}{4}\left(1 - \sqrt{3}\right)$

find the exact value of

$\frac{\pi}{6} \quad \frac{\pi}{4} \quad \frac{\pi}{3}$

$\frac{2\pi}{12} \quad \frac{3\pi}{12} \quad \frac{4\pi}{12}$

$\tan \frac{7\pi}{12}$

$= \tan\left(\frac{\pi}{4} + \frac{\pi}{3}\right)$

$= \boxed{\frac{\tan\frac{\pi}{4} + \tan\frac{\pi}{3}}{1 - \tan\frac{\pi}{4}\tan\frac{\pi}{3}}}$

$= \frac{1 + \sqrt{3}}{1 - (1)(\sqrt{3})} \cdot \frac{1 + \sqrt{3}}{1 + \sqrt{3}}$

$= \frac{1 + 2\sqrt{3} + 3}{1 - 3}$

$= \frac{4 + 2\sqrt{3}}{-2}$

$= \frac{2(2 + \sqrt{3})}{-2}$

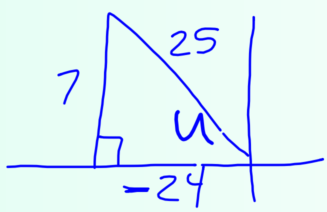
$= \boxed{-2 - \sqrt{3}}$

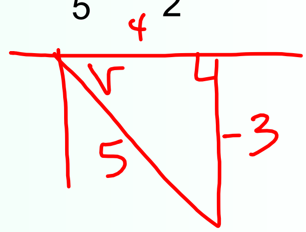
Simplify: $\sin 140^\circ \cos 50^\circ + \cos 140^\circ \sin 50^\circ$

$\sin(140^\circ + 50^\circ)$

$\sin(190^\circ)$

$\sin u = \dfrac{7}{25}$; $\dfrac{\pi}{2} < u < \pi$ and $\cos v = \dfrac{4}{5}$; $\dfrac{3\pi}{2} < v < 2\pi$





Find $\cos(u - v) = \cos u \cos v + \sin u \sin v$

$\left(-\dfrac{24}{25}\right)\left(\dfrac{4}{5}\right) + \left(\dfrac{7}{25}\right)\left(-\dfrac{3}{5}\right)$

Verify the cofunction identity:

$$\sin\left(\frac{\pi}{2} - x\right) = \cos x$$

$$\sin\left(\frac{\pi}{2} - x\right) = \cos x$$

$\sin\frac{\pi}{2}\cos x - \cos\frac{\pi}{2}\sin x$

$(1)\cos x - (0)\sin x$

$\cos x = \cos x$ ✓

HW: PC book p. 430

#1 - 31 odd

Group Verify: Wednesday

(counts as class activity)